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Updating the distribution of *Dicrodon guttulatum* Duméril & Bibron, 1839 (Reptilia, Teiidae) with a disjunct population in the eastern slope of the Peruvian Andes

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Abstract

We report a disjunct population of *Dicrodon guttulatum* Duméril & Bibron, 1839 on the eastern slope of the Cordillera Occidental in the inter-Andean Seasonally Dry Forests of the Marañón River, in the Departments of Cajamarca and Piura in northwestern Peru. We include an updated range distribution map using records from museum specimens, the Global Biodiversity Information Facility, and available photographic records on iNaturalist. In addition, we identify widespread cultivation of rice crops as the main threat to *D. guttulatum* in the inter-Andean Seasonally Dry Forests of the Marañón.

Keywords

Dry forest, Huancabamba Depression, Chamaya River, Marañón River, inter-Andean valley

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Introduction

The teiid lizard *Dicrodon guttulatum* Duméril & Bibron, 1839 is distributed along the dry coastal fringe between northern Peru and Ecuador (Peters and Donoso-Barros 1970). In Peru it inhabits the Sechura desert and the equatorial dry forests in the departments of Tumbes, Piura, Lambayeque, and La Libertad; in Ecuador it is found mainly on the south-central coast where it inhabits shrublands and deciduous forests in the provinces of El Oro, Guayas, Santa Elena, and Manabí (Carrillo and Icochea 1995; van Leeuwen et al. 2011; Havik et al. 2014; Perez et al. 2017; Torres-Carvajal et al. 2019).

Dicrodon guttulatum is herbivorous and feeds on different types of food; it is not specialized on "algarrobo", *Prosopis* L. species (Pollack et al. 2007). On the Peruvian coast, its diet is based on shoots and tender fruits of *Prosopis pallida* (Humb. & Bonpl. ex Willd.) Kunth, leaflets of *Vachellia aroma* var. *huarango* (Ruíz & J. Macbr.) Seigler & Ebinger, and *Vachellia macracantha* (Humb. & Bonpl. ex Willd.) Seigler & Ebinger; seeds of *Encelia canescens* Lam., *Scutia spicata* (Humb. & Bonpl. ex Schult.) Weberb., and *Morisonia crotonoides* (Kunth) Christenh. & Byng, which confirms a certain degree of selectivity in its diet (Pollack et al. 2007). Moreover, it is considered an efficient seed disperser of some of the shrubby plants on which it feeds (Pollack et al. 2007).

Dicrodon guttulatum is categorized as Least Concern by the International Union for Conservation of Nature (IUCN 2022), despite the severe fragmentation of its populations, and the continuous decline in the number of individuals (Perez et al. 2017).

During a recent inventory of biodiversity carried out by the Proyecto Especial Olmos Tinajones (Gobierno Regional de Lambayeque) and Universidad Nacional Toribio Rodríguez de Mendoza de Amazonas/Instituto de Investigación para el Desarrollo Sustentable de Ceja de Selva (UNTRM/INDES-CES), we recorded a disjunct population of *D. guttulatum* in the ecoregion of the inter-Andean Seasonally Dry Forests of the Marañón River (ISDFM) (Linares-Palomino 2006), in the Departments of Cajamarca and Piura, on the eastern slope of the Cordillera Occidental.

We produce a new map of the geographic distribution of *D. guttulatum* using our new data and data from specimens in museums and online platforms with photographic or voucher evidence.

Methods

We collected specimens under a research permit issued by the Ministerio de Desarrollo Agrario y Riego (Resolución de Dirección General Nº D000010-2021-MIDAGRI-SERFOR-DGGSPFFS, 12/01/2021).

We conducted an expedition on 21–24.VI.2021 with team members from the UNTRM/INDES-CES (Appendix Table A1). The area assessed is in the lower basin of the Chamaya River.

At each site, we opportunistically searched for *D. guttulatum* within suitable microhabitats. Some individuals were collected following the protocols by Koch et al. (2018). At each site we recorded the following data: geographical coordinates and altitude above sea level using a GPS receiver (Garmin Montana 680 using the WGS84 geodetic datum), air humidity (RH%), and temperature (°C) taken with a digital thermohygrometer (Elitech RC-4HC) mounted with an external sensor.

We photographed live individuals (uncaptured and in their microhabitat), then we attempted to capture them by hand or using a slingshot. Once captured, we placed lizards in cloth bags. After capture, we photographed individuals dorsally, ventrally, and laterally. We then euthanized lizards by injecting 0.5 ml of Halatal® into the heart area, using a tuberculin syringe. We also photographed the microhabitat, lizard burrows, and threats at each locality.

We used QGIS v. 3.16.6 (https://qgis.org/es/site/index.html) to create the map of *D. guttulatum* (Fig. 2) in Peru and Ecuador using our new data (UNTRM/INDES-CES expedition, 21–24.VI.2021), data from specimens in the herpetological collection of Centro de Ornitología y Biodiversidad (CORBIDI, http://www.corbidi.org/), data from specimens in the Museo de Zoología de la Pontificia Universidad Católica del Ecuador (QCAZ/PUCE), and data from other specimens obtained through the Global Biodiversity Information Facility (GBIF; https://www.gbif.org/) in the National Museum of Natural History, Smithsonian Institution (USNM), Museum of Vertebrate Zoology, University of California, Berkeley (MVZ), Biodiversity Institute & Natural History Museum, the University of Kansas (KU), Natural History Museum of Los Angeles County (LACM), California Academy of Sciences (CAS), Museum of Comparative Zoology, Harvard University (MCZ), and San Diego Natural History Museum (SDNHM), and photographic records from iNaturalist (https://www.inaturalist.org/). A polygon of the potential geographic range, as a shapefile, was obtained from the IUCN (https://www.iucnredlist.org/) for inclusion on our map.

The GBIF data were filtered according to the following criteria: no coordinates, repeated coordinates, human observations without any evidence such as photographs, altitude outside the defined range, and finally citizen- science observations with photographic records belonging to iNaturalist. The iNaturalist data were reviewed one by one and all misidentified records were deleted [e.g., https://www.inaturalist.org/observations/24982312, which is *Ameiva ameiva* (Linnaeus, 1758)].

Results

On 16 January 2020, during biological monitoring at the Limón dam, Caserío Huabal, which is part of the area affected by the Olmos Irrigation Diversion, two of us (AGB and JQR) recorded three individuals of *D. guttulatum* (Fig. 1A), including a photograph of a juvenile individual on the left bank of the Chamaya River.

During the UNTRM/INDES-CES expedition, we recorded 13 individuals of *Dicrodon guttulatum* (Appendix Table A1), including males (Fig. 1B), females, and juveniles. Four specimens were collected, three of which were adult males, and one was a juvenile of indeterminate sex.

New record. PERU – **Cajamarca Department** • Jaén Province, San Felipe District, Caserío Huabal; −05.8787, −079.3400; 997 m a.s.l.; 22.VI.2021; Antonio García-Bravo leg.; 3 ♂, CORBIDI 23341–23344, 23345, 1 juv. CORBIDI 23342 • Jaén Province, San Felipe District, Caserío Huabal; −05.8787, −079.3400; 997 m a.s.l.; 22.VI.2021; Antonio García-Bravo, Betty K. Guzman, Jani E. Mendoza, Jhon Quiñones Rámirez, J. Luis Zabarburu-Veneros obs.; 8 (sex unverified) – **Piura Department** • Huancabamba Province, Huarmaca District, Sector el Mango, Caserío el Progreso; −05.7809, −079.3942; 1203 m a.s.l.; 22.VI.2021; Antonio García-Bravo obs.; 1 (sex unverified).

In Caserío Huabal, we observed the species living in burrows that may be interconnected. The burrows are built in sandy soils (Fig. 1C) in which *Prosopis juliflora* (Sw.) DC., *Vachellia macracantha*, and *Vallesia glabra* (Cav.) Link were common plants within the ISDFM ecosystem (Fig. 1D). We found seeds of *V. glabra* in the feces surrounding the burrows of *D. guttulatum* (Fig. 1E).

The search for additional records of *D. guttulatum* yielded 103 localities between Ecuador and Peru: 27 from the CORBIDI Herpetology Division, 54 from

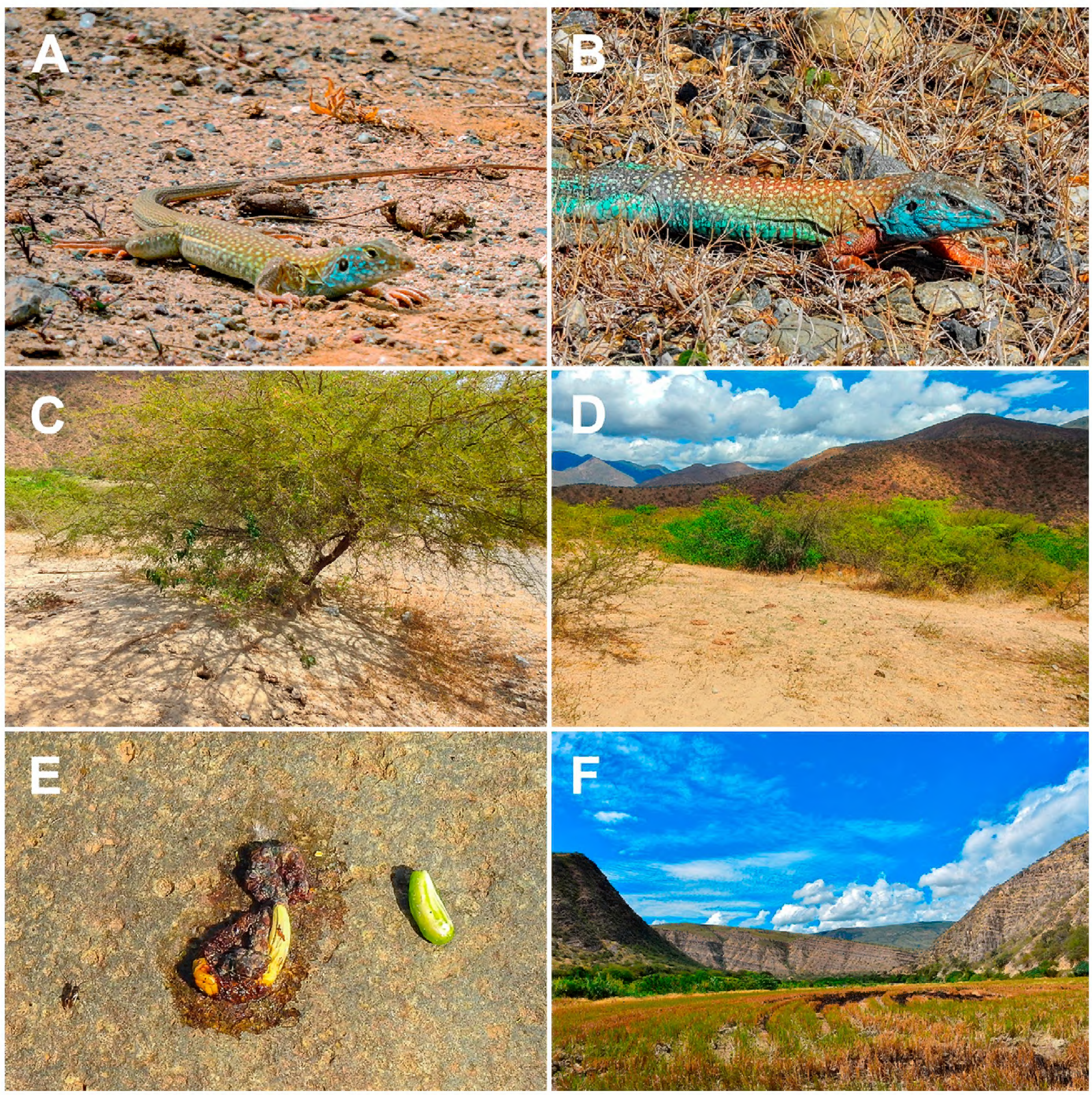

Figure 1. *Dicrodon guttulatum*. **A.** An adult individual, reported on 16.I.2020, on the bank of the Limón dam, Caserío Huabal, on the left side of the Chamaya River. **B.** An adult individual, reported on 22.VI.2021, on the banks of the Limón dam, Caserío Huabal, on the left side of the Chamaya River. **C.** Burrows, Caserío Huabal. **D.** Microhabitat, Caserío Huabal. **E.** Feces with seeds of *Vallesia glabra*. **F.** Threats to the microhabitat: Rice fields burned. Photographs **A–D** by Antonio García-Bravo, **E** by J. Luis Zabarburu-Veneros and **F** by Jani E. Mendoza.

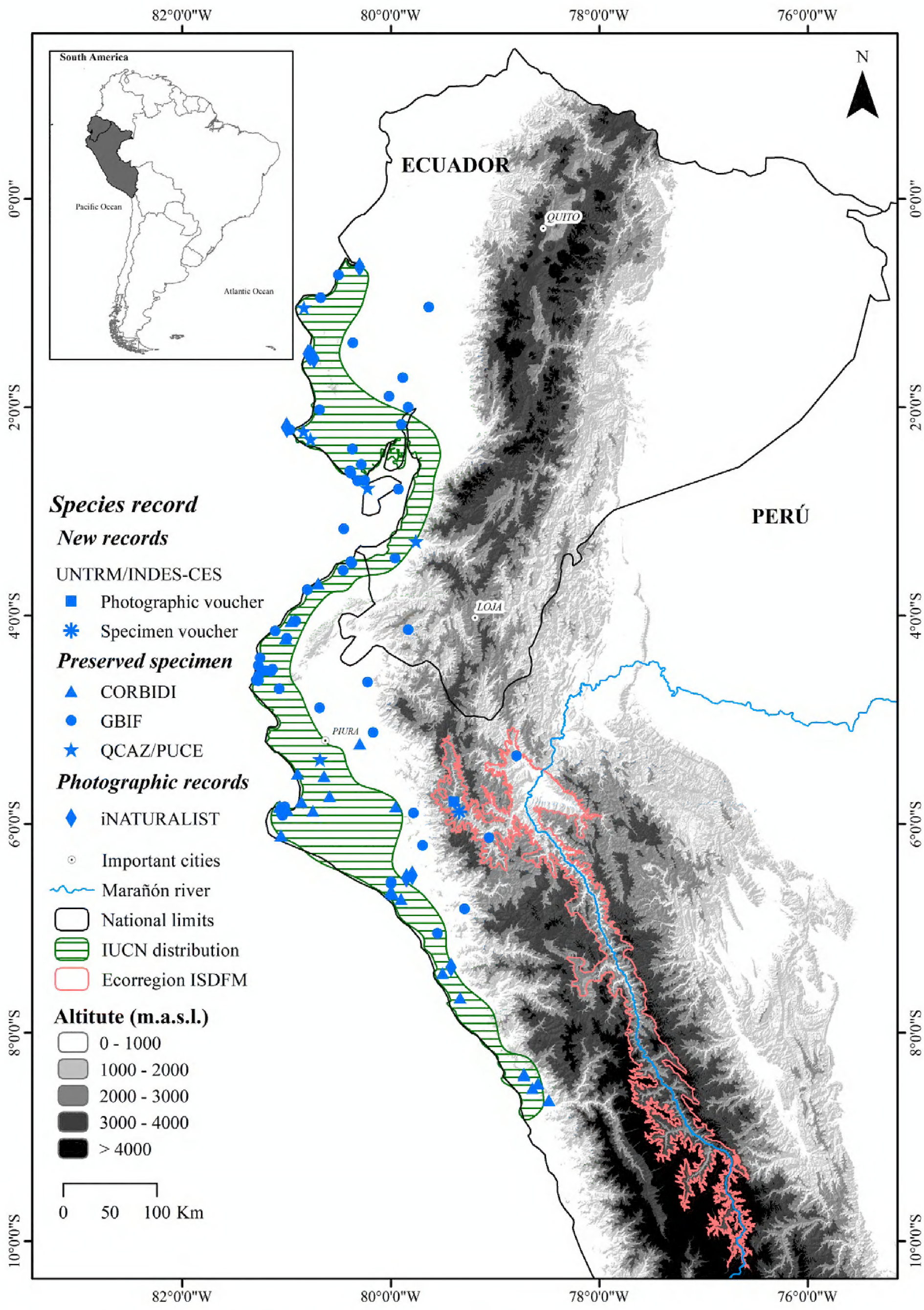

Figure 2. Distribution map of *Dicrodon guttulatum* in Peru and Ecuador.

GBIF, six from QCAZ/PUCE, and 16 from iNaturalist (Fig. 2; Appendix Table A1).

Identification. We identified our collected specimens as *D. guttulatum* by presence of the following characters: (1) bicuspid teeth, (2) an entire frontal scale, and (3) granular dorsal scales (Harvey et al. 2012). These three characters readily distinguish *D. guttulatum* from other species of teiids from Peru. The most similar species to *D. guttulatum* is *Dicrodon heterolepis* (Tschudi, 1845) which possesses keeled dorsal scales. In addition, *Ameiva aggerecusans* Koch, Venegas, Rödder, Flecks & Böhme, 2013, *Ameiva nodam* Koch, Venegas, Rödder, Flecks & Böhme, 2013, and *Ameiva concolor* (Ruthven, 1924) also inhabit the IASDFM (Koch et al. 2018). These *Ameiva* species can be easily distinguished by having the frontal scale transversally divided (Koch et al. 2018). The photographic records of *D. guttulatum* from iNaturalist were identified as having yellow or cream dots on the back and a blue or reddish head, shown mainly in males, which differs from the pattern of longitudinal lines of other coastal species of Ecuador and Peru such as *Medopheuos edracanthus* (Bocourt, 1874) and *Holcosus septemlineatus* (Duméril, 1851).

Discussion

With our new records and other data, we extend the geographical distribution and altitudinal range of *Dicrodon guttulatum* to include the eastern slope of Cordillera Occidental of northern Peru, extending the altitudinal range of this species to about 1400 m a.s.l., and the geographical distribution by approximately 50 km in a straight-line northeast of the previously known easternmost record, 12 km north of Olmos on the Pan American Highway (MVZ 163081 in Appendix Table A1).

The previously known distribution of *D. guttulatum* only included the northern coast and Pacific slope of Peru and central Ecuador (Pollack et al. 2007; Van Leeuwen et al. 2011; Havik et al. 2014; Perez et al. 2017; Torres-Carvajal et al. 2019). However, there are unpublished historical records available in GBIF: collections of G.K. Noble (1.IX.1916) from Perico, San Ignacio province, Cajamarca Department, MCZ R-18778, R-18779, R-18780, R-18781, R-18782 and R-18783; and collections of R.B. Huey (20.VIII.1967) from El Arenal, Chamaya River, province of Jaén, Cajamarca Department, MVZ Herp:82426 and 82427. These have gone unnoticed until now despite their biogeographical importance.

We believe that *D. guttulatum* has not been recorded from the IASDFM in the last two decades by Koch et al. (2018) probably because some populations have disappeared (e.g., thoseat recorded by G.K. Noble in 1916). The likely cause for local extirpation is that the flat and gently sloping areas with sandy soils used by this species for digging burrows are highly suitable for rice cultivation. The cultivation of rice crops floods the soils for weeks during the planting stage, and after the harvest the remains of the plantation are burned (Fig. 1F).

Pollack et al. (2007) examined the feces of *D. guttulatum* in coastal Peru and reported seven plant species as part of its diet: *Prosopis juliflora*, *P. pallida*, *Vachellia macracantha*, *V. aroma* var. *huarango*, *Encelia canescens*, *Morisonia crotonoides*, and *Vallesia glabra*. We also identified *V. glabra*, a common scrub in ISDFM (Fig. 1D), in the feces of *D. guttulatum* (Fig. 1E).

With our new records and the secondary data, we confirm that *D. guttulatum* is distributed on both sides of the Cordillera Occidental of northern Peru. Other species of lizards that were previously only known from the coast and Pacific slope of Andes from Peru and Ecuador have likewise been recently reported in the ISDFM: *Callopistes flavipunctatus* (Duméril & Bibron, 1839) and *Phyllodactylus reissii* Peters, 1862 (Crespo and Koch 2015; Koch et al. 2018). We hypothesize that these trans-Andean lizards probably used the Huancabamba Depression as a corridor between opposite slopes of the western Cordillera Occidental in northwestern Peru.

Seven natural protected areas occur in the IASDFM, covering an area of over 45,000 ha and accounting for 1.97% of area of this ecoregion (Guzman et al. 2021). However, *D. guttulatum* is not protected in any of these protected areas in the ISDFM, and we, therefore, suggest areas where this species occurs should be afforded protection. The main threats to the disjunct population of *D. guttulatum* in the ISDFM are the widespread cultivation of rice crops (Fig. 1F), which is mainly done in the lower part of the Chamaya River valley, the extraction of aggregates (sand and rocks) for construction, and, as a potential threat, the planned Limón dam project. Importantly, local people do not consume this species here, as is the case in some towns along the Peruvian coast (Holmberg 1957).

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Authors' Contributions

Conceptualization: AGB, BKG. Data curation: AGB, BKG. Formal analysis: AGB, BKG. Funding acquisition: AGB, BKG, MO. Investigation: AGB, BKG.

Methodology: AGB, BKG, CTG, JEM, JLZV, PJV, JQR. Project administration: AGB. Supervision: MO, PJV. Visualization: AGB, BKG. Writing – original draft: BKG, CTG, EB, JEM, JLZV, JQR, MO. Writing – review and editing: AGB, PJV.

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Appendix

Table A1. Records of the locations of *Dicrodon guttulatum* Duméril & Bibron, 1839 in Peru and Ecuador.

Locality	District (Parroquia)	Province (Cantón)	Department (province)	Country	Date	Institution	Geographic coordinates		Altitude (m)	Voucher	
							Latitude	Longitude		Specimen	Photograph
Caserío Huabal	San Felipe	Jaén	Cajamarca	Perú	22.VI.2021	UNTRM/INDES-CES	−05.8787	−079.3400	997	X	X
Sector el Mango, Caserío el Progreso	Huarmaca	Huancabamba	Piura	Perú	22.VI.2021		−05.7809	−079.3942	1203	—	X
Puerto López	Puerto López	Puerto López	Manabí	Ecuador	1.I.2012	iNaturalist	−01.5353	−080.7352	74	—	X
Machalilla	Machalilla	Puerto López	Manabí	Ecuador	5.I.2017		−01.4846	−080.7723	19	—	X
Salinas	Salinas	Salinas	Santa Elena	Ecuador	18.X.2020		−02.1942	−081.0021	7	—	X
ACP Bosque de Cañoncillo	San José	Pacasmayo	La Libertad	Perú	21.VIII.2016		−07.3723	−079.4217	122	—	X
Túcume	Túcume	Lambayeque	Lambayeque	Perú	2.III.2016		−06.5155	−079.8507	48	—	X
Salinas	Salinas	Salinas	Santa Elena	Ecuador	29.VIII.2019		−02.1877	−080.9977	71	—	X
Salinas	Salinas	Salinas	Santa Elena	Ecuador	13.XI.2019		−02.2029	−080.9959	7	—	X
Agua Blanca	Machalilla	Puerto López	Manabí	Ecuador	27.XII.2019		−01.5309	−080.7408	68	—	X
Salinas	Salinas	Salinas	Santa Elena	Ecuador	2.I.2020		−02.2027	−080.9955	7	—	X
Machalilla	Machalilla	Puerto López	Manabí	Ecuador	15.III.2019		−01.4949	−080.7902	14	—	X
Machalilla	Machalilla	Puerto López	Manabí	Ecuador	15.III.2019		−01.5172	−080.7715	32	—	X
Machalilla	Machalilla	Puerto López	Manabí	Ecuador	10.VII.2017		−01.4877	−080.7924	30	—	X
SN Bosque de Pómac	Pítipo	Ferreñafe	Lambayeque	Perú	10.X.2015		−06.4920	−079.7950	67	—	X
SN Bosque de Pómac	Pítipo	Ferreñafe	Lambayeque	Perú	13.XI.2019		−06.4919	−079.7950	66	—	X
Near Salinas	Puerto Larrea	Tosagua	Manabí	Ecuador	11.VII.2016		−00.6558	−080.2996	3	—	X
Salinas	Salinas	Salinas	Santa Elena	Ecuador	1.IV.2017		−02.2029	−080.9958	6	—	X
Manglares de San Pedro de Vice	Vice	Sechura	Piura	Perú	25.II.2009	CORBIDI	−05.5134	−080.8926	0	X	—
El Peñal	Cristo nos Valga	Sechura	Piura	Perú	29.II.2009		−05.5365	−080.6400	0	X	—
Vega de Palomino	Chulucanas	Morropón	Piura	Perú	9.III.2009		−05.2268	−080.2973	173	X	—
Cerro Huacrupe	Olmos	Lambayeque	Lambayeque	Perú	24.III.2009		−05.8296	−079.9516	161	X	—
Estuario Virrilá	Sechura	Sechura	Piura	Perú	27.II.2009		−05.7809	−080.8577	0	X	—
Zorritos	Zorritos	Contralmirante Villar	Tumbes	Perú	29.V.2009		−03.6890	−080.6958	0	X	—
Monte de La Virgen	Lambayeque	Lambayeque	Lambayeque	Perú	16.X.2004		−06.7177	−079.9041	29	X	—
Alrrededores de la laguna La Niña	Sechura	Sechura	Piura	Perú	4.VI.2012		−05.7295	−080.5867	9	X	—
Estuario de Virrila	Sechura	Sechura	Piura	Perú	8.VI.2012		−05.8717	−080.7472	6	X	—
Peninsula de Illescas	Sechura	Sechura	Piura	Perú	4.VII.2012		−05.8622	−080.9944	75	X	—
Cerca al canal madre de CHAVIMOCHIC	Chao	Virú	La Libertad	Perú	15.III.2014		−08.4846	−078.5882	236	X	—
San Pedro de Lloc (alrededores de la ciudad)	San Pedro de Lloc	Pacasmayo	La Libertad	Perú	4.IX.2014		−07.4267	−079.5039	43	X	—
Zona reservada de Illescas	Sechura	Sechura	Piura	Perú	28.III.2013		−05.8241	−081.0658	167	X	—
Zona reservada de Illescas	Sechura	Sechura	Piura	Perú	20.VII.2013		−05.8329	−081.0628	182	X	—
Zona Reservada Illescas	Sechura	Sechura	Piura	Perú	6.IV.2016		−06.1063	−081.0526	13	X	—
Zona Reservada Illescas	Sechura	Sechura	Piura	Perú	6.IV.2016		−06.1070	−081.0516	10	X	—
Carretera Mancora-Puntasal	Canoas de Punta Sal	Contralmirante Villar	Tumbes	Perú	.X.2002		−04.0515	−080.9549	27	X	—

Locality	District (Parroquia)	Province (Cantón)	Department (province)	Country	Date	Institution	Geographic coordinates		Altitude (m)	Voucher	
							Latitude	Longitude		Specimen	Photograph
Montes de La Virgen	Lambayeque	Chiclayo	Lambayeque	Perú	.I.2002	CORBIDI	−06.7164	−079.9005	34	X	—
La Arenita parte baja	Razuri	Ascope	La Libertad	Perú	2.V.2018		−07.6650	−079.3340	81	X	—
Campamento San Carlos	Chao	Virú	La Libertad	Perú	17.IX.2018		−08.5310	−078.6400	129	X	—
Quebrada de Palo Redondo	Chao	Virú	La Libertad	Perú	11.VII.2017		−08.6450	−078.4830	436	X	—
Campamento San José	Virú	Virú	La Libertad	Perú	27.IV.2017		−08.4090	−078.7220	127	X	—
Los Organos	Los Organos	Talara	Piura	Perú	20.X.2018		−04.2172	−081.0090	337	X	—
Campiña Zaraque	Virú	Virú	La Libertad	Perú	14.XI.2018		−08.3920	−078.7210	118	X	—
dunas	Lambayeque	Lambayeque	Lambayeque	Perú	3.III.2020		−06.6510	−080.0030	6	X	—
Dunas con mucha vegetación	Lambayeque	Lambayeque	Lambayeque	Perú	21.IX.2020		−06.6510	−080.0029	16	X	—
Por carretera a avícola	Lambayeque	Lambayeque	Lambayeque	Perú	19.IX.2021		−06.6707	−079.9797	14	X	—
San Clemente (between Charapote & Bahia), 2 km N of	Charapoto	Sucre	Manabí	Ecuador	17.X.1965	GBIF	−00.7306	−080.5014	60	X	—
Playas, 1 KM N	General Villamil	Playas	Guayas	Ecuador	3.I.1959		−02.6167	−080.3917	12	X	—
Colonche, 1 KM SW	Colonche	Santa Elena	Santa Elena	Ecuador	8.X.1965		−02.0250	−080.6833	8	X	—
Playas, 12 KM SE, Villamil	General Villamil	Playas	Guayas	Ecuador	9.I.1959		−02.7083	−080.3167	6	X	—
Manta, 6 km SE of, 5 km NW of Montecristi	Manta	Manta	Manabí	Ecuador	15.X.1965		−00.9500	−080.6714	20	X	—
El Empalme (= Velasco Ibarra), junction of Quito-Manta-Guayaquil Road	Velasco Ibarra	El Empalme	Guayas	Ecuador	.II.1965		−01.0406	−079.6361	70	X	—
Valle de Casanga, El Empalme	El Empalme	Paltas	Loja	Ecuador	.III.1961		−04.1333	−079.8333	699	X	—
Pariñas Valley	Pariñas	Talara	Piura	Perú	.XI.1940		−04.5278	−081.2000	30	X	—
6 km SSE Bayovar	Sechura	Sechura	Piura	Perú	31.VII.1968		−05.9001	−081.0459	352	X	—
5 km SE Bayovar	Sechura	Sechura	Piura	Perú	10.VIII.1968		−05.8820	−081.0347	355	X	—
vicinity of Tric Trac, 2 km E Bayovar	Sechura	Sechura	Piura	Perú	31.VII.1968		−05.8333	−081.0167	10	X	—
5 mi SSE Bayovar	Sechura	Sechura	Piura	Perú	13.VIII.1968		−05.9168	−081.0390	366	X	—
3 km SE Morrope	Morrope	Lambayeque	Lambayeque	Perú	15.VII.1967		−06.5525	−079.9975	30	X	—
4 km SE Bayovar	Sechura	Sechura	Piura	Perú	22.VII.1967		−05.8589	−081.0245	141	X	—
7 km SSE Mocupe	Lagunas	Chiclayo	Lambayeque	Perú	6.IX.1967		−07.0462	−079.5515	91	X	—
11 km N & 28 km E Barranco, Cabo Blanco	Cabo Blanco	Talara	Piura	Perú	7.VIII.1967		−04.2172	−080.9978	234	X	—
El Arenal, Río Chamaya	San Felipe	Jaén	Cajamarca	Perú	20.VIII.1967		−06.1289	−079.0572	944	X	—
Parinas, 7 km N & 15 km E Talara	Pariñas	Pariñas	Talara	Perú	3.VIII.1967		−04.5125	−081.1340	129	X	—
Playas, 60 mi SW Guayaquil	General Villamil	Playas	Guayas	Ecuador	3.III.1964		−02.5507	−080.2814	24	X	—
Playas	General Villamil	Playas	Guayas	Ecuador	3.III.1964		−02.6330	−080.3830	7	X	—
3 mi N Oyotun	Oyotun	Chiclayo	Lambayeque	Perú	29.VIII.1969		−06.8119	−079.2914	305	X	—
2 mi SE Morrope	Morrope	Lambayeque	Lambayeque	Perú	16.VIII.1970		−06.5705	−079.9962	30	X	—
Quebrada, between Talara & Lobitos	Lobitos	Talara	Piura	Perú	1.XII.1980		−04.4783	−081.2703	21	X	—
Quebrada, ca. 5 km NE (by air) Negritos	La Brea	Talara	Piura	Perú	2.XII.1980		−04.6230	−081.2704	66	X	—
12 km N Olmos on Pan American Hwy.	Olmos	Lambayeque	Lambayeque	Perú	30.VIII.1978		−05.8925	−079.7831	152	X	—
Parinas, 7 km N & 14 km E Talara	Pariñas	Talara	Piura	Perú	20.II.1972		−04.5333	−081.1500	30	X	—
2.2 km N Playas	General Villamil	Playas	Guayas	Ecuador	17.VI.1971		−02.6083	−080.3917	13	X	—
Playas	General Villamil	Playas	Guayas	Ecuador	14.VII.1971		−02.6333	−080.3833	8	X	—

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Sierra de la Vieja 7 km S Motupe	Motupe	Lambayeque	Lambayeque	Perú	4.VI.1976	GBIF	−06.2028	−079.6944	119	X	—
5 km E, 4.2 km NNE Lobitos	Lobitos	Talara	Piura	Perú	6.XII.1968		−04.4042	−081.2528	19	X	—
3 km S Talara	La Brea	Talara	Piura	Perú	3.XII.1968		−04.6167	−081.2889	43	X	—
2.4 km SW Chulucanas, in Mesquito thicket along Rio Piura	Chulucanas	Morropón	Piura	Perú	1.XII.1968		−05.1194	−080.1694	87	X	—
3.7 km ENE Los Organos Breach Dunes	Los Órganos	Talara	Piura	Perú	4.XII.1968		−04.1458	−081.1083	8	X	—
3 km ENE Las Lomas in sandy area	Las Lomas	Piura	Piura	Perú	6.XII.1968		−04.6361	−080.2222	274	X	—
Quebrada Seca, 11.8 km ENE Mancora, under bark in misquito grove	Canoas de Punta Sal	Contralmirante Villar	Tumbes	Perú	4.XII.1968		−04.0500	−080.9125	162	X	—
Puerto Pizarro on estaru beach with mesquite, cacti	Tumbes	Tumbes	Tumbes	Perú	5.XII.1968		−03.4833	−080.3833	1	X	—
1.2 km S., 1 km E Puerto Pizarro in Cacti, Acacia, thorn thicket	Tumbes	Tumbes	Tumbes	Perú	5.XII.1968		−03.4942	−080.3743	3	X	—
Songora, Quebrada	Marcavelica	Sullana	Piura	Perú	22.IX.1940		−04.7000	−081.0694	204	X	—
Sullana	Sullana	Sullana	Piura	Perú	.VII.1916		−04.8833	−080.6833	39	X	—
Grau Tumbes	Tumbes	Tumbes	Tumbes	Perú			−03.5654	−080.4570	10	X	—
Santa Rosa (nr.Salinas),Prov.Guayas	Santa Rosa	Daule	Guayas	Ecuador	13.II.1963		−02.2167	−080.9667	6	X	—
Perico	Chirinos	San Ignacio	Cajamarca	Perú	1.IX.1916		−05.3439	−078.7947	441	X	—
Rocks of Morro,Guayas Prov	La Puntilla	Samborondón	Guayas	Ecuador	13.VI.1964		−02.0000	−079.8333	3	X	—
Buenos Aires,Guayas Prov	Chanduy	Santa Elena	Guayas	Ecuador	6.VI.1964		−02.7857	−079.9267	31	X	—
nr.East data:Guayas Prov	Nobol	Nobol	Guayas	Ecuador	8.III.1963		−01.8960	−080.0160	5	X	—
El Prado, Guayas Prov.	Chongón	Guayaquil	Guayas	Ecuador	8.III.1963		−01.7167	−079.8833	9	X	—
Ecuador: Progresso W. of Guayaquil	Progreso	Guayaquil	Guayas	Ecuador	19.VIII.1964		−02.4000	−080.3667	97	X	—
Ecuador:Santa Rosa	Santa Rosa	Santa Rosa	El Oro	Ecuador	26.IV.1963		−03.4488	−079.9595	11	X	—
Ecuador:Guayaquil,Guayas Prov.	Rocafuerte	Guayaquil	Guayas	Ecuador	29.I.1963		−02.1667	−079.9000	4	X	—
Isla de los Muertos or Isla Santa Clara	Jambelí	Santa Rosa	El Oro	Ecuador	3.V.1963		−03.1667	−080.4500	1	X	—
Peru,Piura Talara Alta	Pariñas	Talara	Piura	Perú	1.I.1980		−04.5758	−081.2692	15	X	—
Posorja, Gulf of Guayaquil	Posorja	Guayaquil	Guayas	Ecuador			−02.7000	−080.2500	3	X	—
Guayas, Buenos Aires	Chanduy	Santa Elena	Guayas	Ecuador	6.VII.1964		−01.3829	−080.3624	396	X	—
Picos Point	Zorritos	Contralmirante Villar	Tumbes	Perú	16.II.1938		−03.7500	−080.8000	1	X	—
El Progreso	El Progreso	Pasaje	El Oro	Ecuador	3.I.1986	QCAZ/PUCE	−03.2883	−079.75812	92	X	—
108 km vía Guayaquil-Salinas	La Libertad	La Libertad	Santa Elena	Ecuador	12.XI.1992		−02.2330	−080.83499	57	X	—
Atahualpa	Atahualpa	Santa Elena	Santa Elena	Ecuador	19.X.1993		−02.3092	−080.7709	46	X	—
El Aromo	San Lorenzo	Manta	Manabí	Ecuador	1.V.2010		−01.0467	−080.8328	297	X	—
La independencia, Dique - La Independencia	Sechura	Sechura	Sechura	Perú	26.XI.2009		−05.3799	−080.6774	29	X	—
Isla Puná, Comuna Bellavista	Posorja	Guayaquil	Guayas	Ecuador	14.XI.2015		−02.7772	−080.2233	9	X	—